

Elucidating the trait association and path coefficient analysis for pod yield, yield component & quality traits in groundnut (*Arachis hypogaea* L.)

D Jyoshna¹, N Sabitha², K John³, P Latha⁴

¹ Department of Genetics and Plant breeding, SVAC, ANGRAU, Tirupati, Andhra Pradesh, India

² Associate professor, Department of Genetics and Plant breeding, SVAC, ANGRAU, Tirupati, Andhra Pradesh, India

³ Principal Scientist, Department of Genetics and Plant breeding, RARS, Tirupati, Andhra Pradesh, India

⁴ Professor and Head, Department of Crop Physiology, S.V. Agricultural college, Tirupati, ANGRAU, Andhra Pradesh, India

DOI: <https://doi.org/10.66856/ijaps.2026.8.4.8287>

Abstract

The present investigation was carried out to assess character association and path coefficient analysis for pod yield and its component traits in groundnut (*Arachis hypogaea* L.). Twenty-five groundnut genotypes, along with two checks (Visishta and K-6), were evaluated in a Randomized Block Design with three replications at the dryland farm of S.V. Agricultural College, Tirupati, during *kharif*, 2025. Observations were recorded on sixteen physiological, yield and quality traits. Phenotypic and genotypic correlation studies revealed that kernel yield plant⁻¹, hundred pod weight, harvest index, hundred kernel weight, specific leaf area at 60 DAS, dry haulm yield plant⁻¹ and plant height exhibited highly significant positive association with pod yield plant⁻¹ at both phenotypic and genotypic levels, whereas days to 50% flowering showed a significant negative association. Path coefficient analysis revealed that kernel yield plant⁻¹ recorded the highest positive direct effect on pod yield plant⁻¹ at both the phenotypic and genotypic levels, followed by harvest index, plant height and hundred pod weight, while most of the remaining traits influenced pod yield mainly through their indirect effects *via* kernel yield plant⁻¹. The low residual effect (phenotypic = 0.007; genotypic = 0.001) indicated that the traits studied accounted for almost all the variability in pod yield. Hence, kernel yield plant⁻¹, hundred pod weight and harvest index may be considered reliable selection indices for improving pod yield in groundnut.

Keywords: Groundnut, genotypic and phenotypic correlation, path coefficient, direct effect, pod yield

Introduction

Groundnut (*Arachis hypogaea* L.) is an annual legume crop that is primarily produced for its easily digestible protein (22-30%) and high-quality edible oil (44-56%) in the seeds. Besides oil and protein, groundnut seeds are a good source of essential minerals such as calcium, phosphorus, and magnesium, vitamins (E, K, and B-complex), and dietary fibre, making it an important component of human nutrition, particularly in developing countries.

Globally, groundnut is cultivated over an area of about 30.19 million hectares with a production of 51.2 million metric tonnes and an average productivity of 1,700 kg ha⁻¹ (USDA, 2026). India ranks first in area (5.87 million ha) and second in production (13.07 million tonnes) after China, with a productivity of 2,228 kg ha⁻¹. In Andhra Pradesh, groundnut is cultivated over 0.29 million hectares with a production of 0.430 million tonnes and productivity of 1,476 kg ha⁻¹ (Ministry of Agriculture, 2025-26). Productivity, however, continues to be constrained under rainfed conditions by moisture stress and narrow genetic variability in the available breeding material.

Pod yield in groundnut is a complex quantitative trait controlled by many genes with small individual effects and is highly influenced by environment. Correlation analysis reveals the strength and direction of association between yield and its component traits, aiding indirect selection for low-heritability traits. However, correlation alone cannot show whether a trait association with yield is due to its direct effect or is mediated through other traits. Path coefficient analysis (Dewey and Lu, 1959) [4] addresses this by partitioning correlation coefficients into direct and

indirect effects, clarifying cause and effect relationships and helping breeders identify reliable selection criteria for yield improvement.

Materials and Methods

The present investigation was carried out at the dryland farm of S.V. Agricultural College, Tirupati, Andhra Pradesh, during *kharif*, 2025. The experimental material comprised twenty-five groundnut genotypes along with two checks, Visishta and K-6, evaluated in a Randomized Block Design (RBD) with three replications.

Observations were recorded for sixteen physiological, yield and quality traits, viz., days to 50% flowering, days to maturity, SPAD chlorophyll meter reading at 60 DAS (SCMR), specific leaf area at 60 DAS (SLA), plant height, number of primary branches plant⁻¹, number of mature pods plant⁻¹, hundred pod weight, hundred kernel weight, shelling percent, dry haulm yield plant⁻¹, harvest index, kernel yield plant⁻¹, oil content, protein content and pod yield plant⁻¹.

Phenotypic and genotypic correlation coefficients among the traits were worked out following the method suggested by Al-Jibouri *et al.* (1958) [1]. Path coefficient analysis was carried out taking pod yield plant⁻¹ as the dependent variable and the remaining fifteen characters as independent variables, following the procedure outlined by Dewey and Lu (1959) [4], so as to partition the genotypic and phenotypic correlation coefficients into direct and indirect effects.

Results and Discussion

Correlation of component traits with pod yield plant⁻¹

The phenotypic (r_p) and genotypic (r_g) correlation coefficients among the sixteen traits studied are presented in

Table-1 and Fig-1&Fig-2. In general, the genotypic correlation coefficients were higher in magnitude than their corresponding phenotypic correlation coefficients for most of the trait combinations, suggesting a strong inherent genetic association between the traits that was somewhat masked at the phenotypic level by environmental influence. Pod yield plant⁻¹ showed highly significant positive correlation with kernel yield plant⁻¹ ($r_p = 0.962^{**}$; $r_g = 0.971^{**}$), hundred pod weight ($r_p = 0.799^{**}$; $r_g = 0.868^{**}$), hundred kernel weight ($r_p = 0.379^{**}$; $r_g = 0.492^{**}$), plant height ($r_p = 0.411^{**}$; $r_g = 0.443^{**}$), specific leaf area at 60 DAS ($r_p = 0.321^{**}$; $r_g = 0.408^{**}$), and dry haulm yield plant⁻¹ ($r_p = 0.366^{**}$; $r_g = 0.442^{**}$) at both phenotypic and genotypic levels. This suggests that selection for these traits would simultaneously improve pod yield. Similar positive associations of pod yield with kernel yield, hundred pod weight, hundred kernel weight, harvest index, and dry haulm yield have been reported by Hampannavar *et al.* (2018) ^[10].

Non-significant positive correlation with pod yield plant⁻¹ was observed for SPAD chlorophyll meter reading at 60 DAS ($r_p = 0.112$; $r_g = 0.171$) and shelling percent ($r_p = 0.208$; $r_g = 0.307$), while number of mature pods plant⁻¹ recorded a significant positive correlation at both levels ($r_p = 0.273^{**}$; $r_g = 0.313^{**}$), which is in agreement with Gedifew (2024) ^[6], who also reported a significant positive association of the number of mature pods per plant with kernel yield in groundnut.

Days to 50% flowering exhibited a highly significant negative correlation with pod yield plant⁻¹ at both phenotypic ($r_p = -0.413^{**}$) and genotypic ($r_g = -0.591^{**}$) levels, whereas non-significant negative correlations were recorded for days to maturity ($r_p = -0.078$; $r_g = -0.148$), number of primary branches plant⁻¹ ($r_p = -0.066$; $r_g = -0.089$) and oil content ($r_p = -0.094$; $r_g = -0.083$). This suggests that early flowering and, to a lesser extent, early maturity are associated with higher pod yield, and that these traits need to be handled with restricted simultaneous selection.

Table 1: Phenotypic (r_p) and genotypic (r_g) correlation coefficients among physiological, yield and quality traits in groundnut

Trait	DFP	DM	SCMR	SLA	PH	NPB	NMP	HPW	HKW	SP	DHY	HI	KYP	OC	PC	PYP
DFP	r_p 1.000	0.133	-0.002	-0.078	-0.084	-0.155	-0.204	-0.223 *	0.001	0.1	-0.028	-0.309 **	-0.329 **	-0.176	0.016	-0.413 **
	r_g 1.000	0.481 *	0.042	-0.098	-0.148	-0.203	-0.327	-0.341	0.071	0.042	-0.208	-0.547 **	-0.499 **	-0.323	0.016	-0.591 **
DM	r_p	1.000	0.276*	-0.167	-0.146	0.232 *	0.203	0.083	-0.059	0.192	-0.143	0.005	-0.008	0.014	-0.124	-0.078
	r_g	1.000	0.449*	-0.061	-0.239	0.211*	0.183	0.098	-0.107	0.392 *	-0.203	-0.09	-0.021	-0.008	-0.151	-0.148
SCMR	r_p		1.000	-0.153	-0.364 **	0.025	-0.164	0.354 **	0.327 **	0.265 *	-0.350 **	0.332 **	0.177	-0.178	0.229*	0.112
	r_g		1.000	-0.146	-0.501**	-0.009	-0.308	0.455 **	0.536 **	0.306	-0.616 **	0.460 **	0.23	-0.407 *	0.295*	0.171
SLA	r_p			1.000	0.543 **	-0.161	-0.16	0.293 **	0.308 **	-0.009	0.403 **	0.1	0.301 **	-0.166	0.227 *	0.321 **
	r_g			1.000	0.634 **	-0.189	-0.149	0.375**	0.356**	-0.025	0.576 **	0.145	0.389 *	-0.249	0.255*	0.408 **
PH	r_p				1.000	-0.091	0.143	0.219**	0.029	-0.116	0.857 **	-0.057	0.343 **	-0.049	0.077	0.411 **
	r_g				1.000	-0.121	0.151	0.252	0.054	-0.149	0.905 **	-0.084	0.365	-0.033	0.035	0.443 **
NPB	r_p					1.000	0.373 **	-0.013	-0.278 *	0.016	-0.109	0.085	-0.059	0.164	-0.435 **	-0.066
	r_g					1.000	0.436 **	-0.006	-0.356	0.045	-0.151	0.103	-0.073	0.199	-0.515 **	-0.089
NMP	r_p						1.000	0.161	-0.17	0.232*	0.183	0.236 *	0.305**	0.254 *	-0.247 *	0.273 *
	r_g						1.000	0.195	-0.264	0.325*	0.19	0.294*	0.349**	0.337*	-0.322	0.313*
HPW	r_p							1.000	0.392 **	0.293 **	0.153	0.759 **	0.812 **	-0.058	0.174	0.799 **
	r_g							1.000	0.523 **	0.355**	0.223	0.823**	0.866 **	-0.144	0.217	0.868 **
HKW	r_p								1.000	0.273 *	-0.005	0.402**	0.433 **	-0.343 **	0.334 **	0.379 **
	r_g								1.000	0.365**	0.022	0.519 **	0.550 **	-0.464 *	0.401 *	0.492 **
SP	r_p									1.000	-0.161	0.414 **	0.457 **	0.118	-0.003	0.208
	r_g									1.000	-0.222	0.513 **	0.521 **	0.079	0.037	0.307
DHY	r_p										1.000	-0.075	0.290 **	-0.029	0.019	0.366**
	r_g										1.000	-0.159	0.338**	0.024	0.025	0.442 **
HI	r_p											1.000	0.785 **	-0.034	0.136	0.739 **
	r_g											1.000	0.881 **	-0.066	0.142	0.851 **
KYP	r_p												1.000	-0.063	0.219 *	0.962**
	r_g												1.000	-0.071	0.254*	0.971 **
OC	r_p													1.000	-0.624**	-0.094
	r_g													1.000	-0.804 **	-0.083
PC	r_p														1.000	0.239 *
	r_g														1.000	0.268*

PYP	r_p																	1.000
	r_d																	1.000

DDF = Days to 50% flowering; DM = Days to maturity; SCMR = SPAD chlorophyll meter reading at 60 DAS; SLA = Specific leaf area at 60 DAS ($\text{cm}^2 \text{g}^{-1}$); PH = Plant height (cm); NPB = Number of primary branches plant^{-1} ; NMP = Number of mature pods plant^{-1} ; HPW = Hundred pod weight (g); HKW = Hundred kernel weight (g); SP = Shelling percent (%); DHY = Dry haulm yield plant^{-1} (g); HI = Harvest index (%); KYP = Kernel yield plant^{-1} (g); OC = Oil content (%); PC = Protein content (%); PYP = Pod yield plant^{-1} (g)

* Significant at 5% level; ** Significant at 1% level

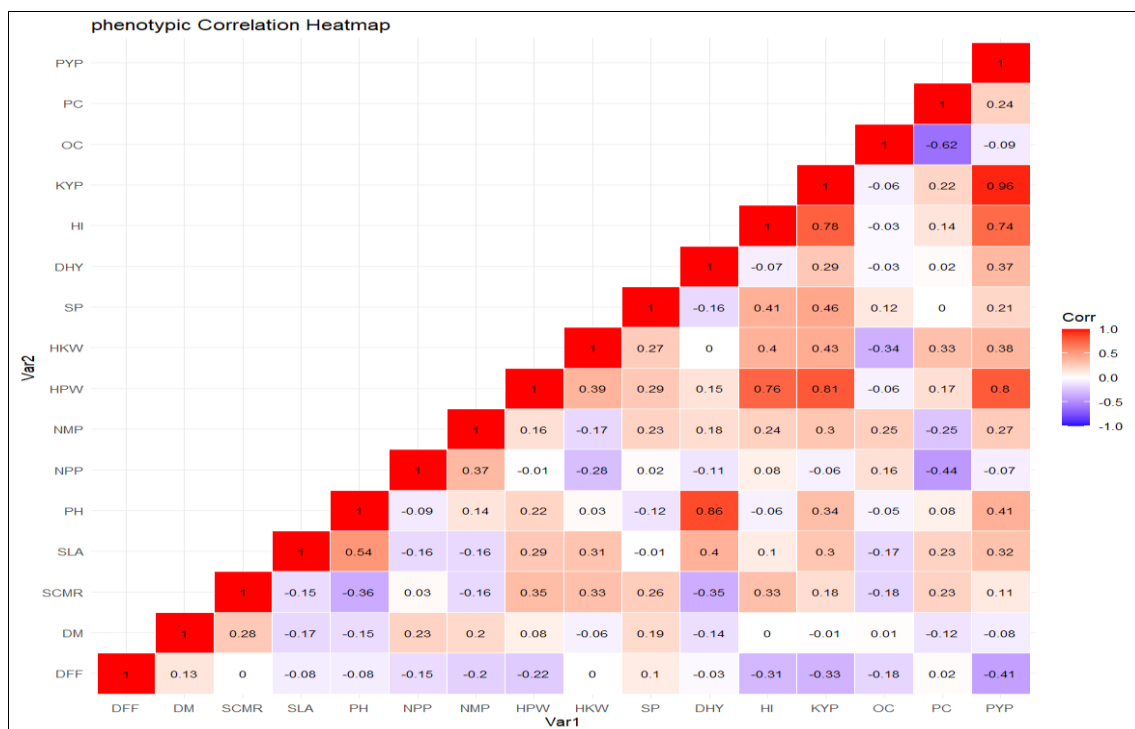


Fig 1: Phenotypic heat map for physiological, yield attributes and quality traits.

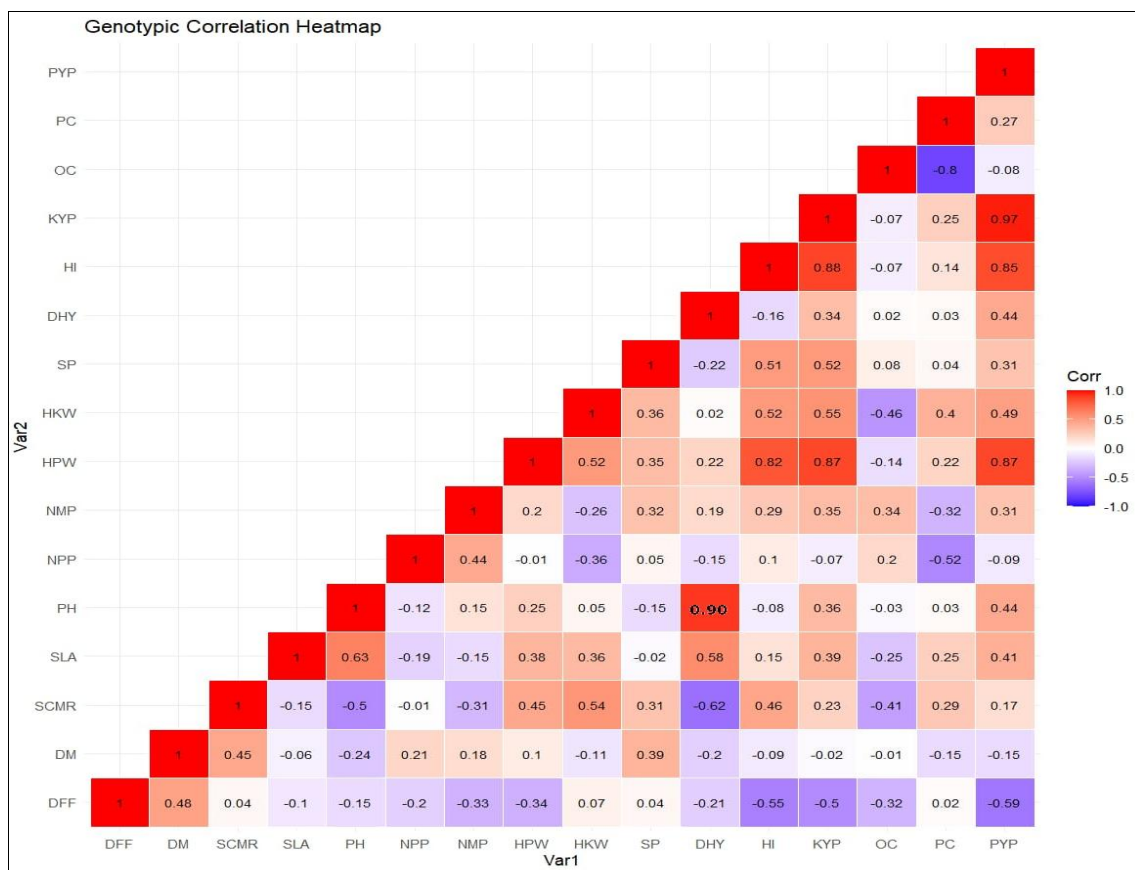


Fig 2: Genotypic heat map for physiological, yield attributes and quality traits

Table 2: Phenotypic (P) and genotypic (G) path coefficients showing direct and indirect effects of component traits on pod yield plant⁻¹ in groundnut

		DFP	DM	SCMR	SLA	PH	NPP	NMP	HPW	HKW	SP	DHY	HI	KYP	OC	PC	PYP
DFP	P	-0.0277	-0.0018	0.0000	0.0012	-0.0010	0.0006	-0.0001	-0.0003	0.0000	-0.0275	-0.0001	-0.0019	-0.3552	0.0004	0.0001	-0.413 **
	G	0.0091	-0.0296	0.0029	0.0029	-0.0183	0.0011	-0.0098	-0.0030	-0.0033	-0.0115	0.0240	0.0389	-0.5860	-0.0091	0.0002	-0.591
DM	P	-0.0037	-0.0135	0.0007	0.0026	-0.0018	-0.0009	0.0001	0.0001	0.0008	-0.0531	-0.0004	0.0000	-0.0086	0.0000	-0.0005	-0.078
	G	0.0044	-0.0615	0.0309	0.0018	-0.0296	-0.0012	0.0055	0.0009	0.0050	-0.1067	0.0234	0.0064	-0.0252	-0.0002	-0.0019	-0.148
SCMR	P	0.0001	-0.0037	0.0026	0.0024	-0.0045	-0.0001	-0.0001	0.0005	-0.0047	-0.0732	-0.0010	0.0021	0.1910	0.0004	0.0008	0.112
	G	0.0004	-0.0276	0.0688	0.0042	-0.0619	0.0001	-0.0093	0.0040	-0.0251	-0.0834	0.0712	-0.0327	0.2703	-0.0114	0.0037	0.171
SLA	P	0.0022	0.0023	-0.0004	-0.0158	0.0067	0.0006	-0.0001	0.0005	-0.0044	0.0025	0.0011	0.0006	0.3242	0.0003	0.0008	0.321 **
	G	-0.0009	0.0038	-0.0101	-0.0290	0.0784	0.0011	-0.0045	0.0033	-0.0167	0.0067	-0.0665	-0.0103	0.4563	-0.0070	0.0032	0.408 **
PH	P	0.0023	0.0020	-0.0009	-0.0085	0.0124	0.0003	0.0001	0.0003	-0.0004	0.0321	0.0024	-0.0004	0.3691	0.0001	0.0003	0.411 **
	G	-0.0013	0.0147	-0.0345	-0.0184	0.1236	0.0007	0.0045	0.0022	-0.0025	0.0405	-0.1202	0.0060	0.4284	-0.0009	0.0004	0.443 **
NPP	P	0.0043	-0.0031	0.0001	0.0025	-0.0011	-0.0037	0.0002	0.0000	0.0040	-0.0044	-0.0003	0.0005	-0.0634	-0.0003	-0.0016	-0.066
	G	-0.0019	-0.0130	-0.0006	0.0055	-0.0150	-0.0056	0.0131	-0.0001	0.0167	-0.0123	0.0174	-0.0073	-0.0854	0.0056	-0.0065	-0.089
NMP	P	0.0057	-0.0028	-0.0004	0.0025	0.0018	-0.0014	0.0006	0.0003	0.0024	-0.0643	0.0005	0.0015	0.3282	-0.0005	-0.0009	0.273 *
	G	-0.0030	-0.0113	-0.0212	0.0043	0.0186	-0.0025	0.0301	0.0017	0.0124	-0.0884	-0.0219	-0.0209	0.4101	0.0094	-0.0041	0.313*
HPW	P	0.0062	-0.0011	0.0009	-0.0046	0.0027	0.0001	0.0001	0.0015	-0.0056	-0.0811	0.0004	0.0047	0.8737	0.0001	-0.0006	0.799 **
	G	-0.0031	-0.0060	0.0313	-0.0109	0.0312	0.0000	0.0059	0.0087	-0.0244	-0.0965	-0.0258	-0.0585	1.0174	-0.0040	0.0027	0.868 **
HKW	P	0.0000	0.0008	0.0008	-0.0049	0.0004	0.0010	-0.0001	0.0006	-0.0143	-0.0755	0.0000	0.0025	0.4663	0.0007	0.0012	0.379 **
	G	0.0006	0.0066	0.0369	-0.0103	0.0067	0.0020	-0.0079	0.0045	-0.0468	-0.0994	-0.0026	-0.0369	0.6463	-0.0130	0.0050	0.492 **
SP	P	-0.0028	-0.0026	0.0007	0.0001	-0.0014	-0.0001	0.0001	0.0005	-0.0039	-0.2767	-0.0005	0.0026	0.4918	-0.0002	0.0001	0.208
	G	0.0004	-0.0241	0.0211	0.0007	-0.0184	-0.0003	0.0098	0.0031	-0.0171	-0.2723	0.0256	-0.0365	0.6121	0.0022	0.0005	0.307
DHY	P	0.0008	0.0019	-0.0009	-0.0063	0.0106	0.0004	0.0001	0.0002	0.0001	0.0446	0.0028	-0.0005	0.3121	0.0001	0.0001	0.366**
	G	-0.0019	0.0125	-0.0424	-0.0167	0.1286	0.0009	0.0057	0.0019	-0.0010	0.0603	-0.1155	0.0113	0.3969	0.0007	0.0003	0.442 **
HI	P	0.0086	-0.0001	0.0009	-0.0016	-0.0007	-0.0003	0.0002	0.0012	-0.0058	-0.1144	-0.0002	0.0062	0.8452	0.0001	0.0005	0.739 **
	G	-0.0050	0.0055	0.0317	-0.0042	-0.0104	-0.0006	0.0088	0.0072	-0.0243	-0.1397	0.0184	-0.0711	1.0346	-0.0019	0.0018	0.851 **
KYP	P	0.0091	0.0001	0.0005	-0.0047	0.0043	0.0002	0.0002	0.0012	-0.0062	-0.1264	0.0008	0.0048	1.0767	0.0001	0.0008	0.962**
	G	-0.0045	0.0013	0.0158	-0.0113	0.0451	0.0004	0.0105	0.0075	-0.0257	-0.1419	-0.0390	-0.0626	1.1743	-0.0020	0.0032	0.971 **
OC	P	0.0049	-0.0002	-0.0005	0.0026	-0.0006	-0.0006	0.0002	-0.0001	0.0049	-0.0326	-0.0001	-0.0002	-0.0677	-0.0020	-0.0023	-0.094
	G	-0.0029	0.0005	-0.0280	0.0073	-0.0041	-0.0011	0.0101	-0.0013	0.0217	-0.0214	-0.0028	0.0047	-0.0832	0.0280	-0.0101	-0.083
PC	P	-0.0005	0.0017	0.0006	-0.0036	0.0010	0.0016	-0.0002	0.0003	-0.0048	0.0008	0.0001	0.0008	0.2358	0.0013	0.0037	0.239 *
	G	0.0001	0.0093	0.0203	-0.0074	0.0043	0.0029	-0.0097	0.0019	-0.0188	-0.0100	-0.0029	-0.0101	0.2982	-0.0226	0.0126	0.268*

DFP = Days to 50% flowering; DM = Days to maturity; SCMR = SPAD chlorophyll meter reading at 60 DAS; SLA = Specific leaf area at 60 DAS (cm² g⁻¹); PH = Plant height (cm); NPP = Number of primary branches plant⁻¹; NMP = Number of mature pods plant⁻¹; HPW = Hundred pod weight (g); HKW = Hundred kernel weight (g); SP = Shelling percent (%); DHY = Dry haulm yield plant⁻¹ (g); HI = Harvest index (%); KYP = Kernel yield plant⁻¹ (g); OC = Oil content (%); PC = Protein content (%); PYP = Pod yield plant⁻¹ (g)

Diagonal / bold values (kernel yield) denote direct effects; other values in a row are indirect effects via the respective column trait. Last column = correlation coefficient (rp/rg) with pod yield plant⁻¹. Phenotypic residual effect = 0.007; Genotypic residual effect = 0.001.

* Significant at 5% level; ** Significant at 1% level.

Inter-se Correlation among Component Traits

Besides its association with pod yield, kernel yield plant⁻¹ was also significantly and positively correlated with hundred pod weight ($r_p = 0.812^{**}$; $r_g = 0.866^{**}$), harvest index ($r_p = 0.785^{**}$; $r_g = 0.881^{**}$), hundred kernel weight ($r_p = 0.433^{**}$; $r_g = 0.550^{**}$), shelling percent ($r_p = 0.457^{**}$; $r_g = 0.521^{**}$) and number of mature pods plant⁻¹ ($r_p = 0.305^{**}$; $r_g = 0.349^{**}$), indicating that these traits are closely inter-linked and are governed, at least in part, by common genes.

Hundred pod weight showed significant positive association with harvest index ($r_p = 0.759^{**}$; $r_g = 0.823^{**}$) and hundred kernel weight ($r_p = 0.392^{**}$; $r_g = 0.523^{**}$), while plant height was strongly and positively associated with dry haulm yield plant⁻¹ ($r_p = 0.857^{**}$; $r_g = 0.905^{**}$). Specific leaf area at 60 DAS was positively correlated with plant height ($r_p = 0.543^{**}$; $r_g = 0.634^{**}$) and dry haulm yield plant⁻¹ ($r_p = 0.403^{**}$; $r_g = 0.576^{**}$). Days to 50% flowering, on the other hand, was significantly and negatively associated with kernel yield plant⁻¹ ($r_p = -0.329^{**}$; $r_g = -0.499^{**}$).

Since kernel yield plant⁻¹, hundred pod weight, harvest index and hundred kernel weight were positively and significantly correlated both with pod yield and among themselves, improvement in any one of these traits is likely

to bring about a simultaneous increase in the others as well as in pod yield plant⁻¹, and these traits may therefore be exploited together in a selection programme aimed at yield improvement.

Path Coefficient Analysis

Since a correlation coefficient alone does not indicate whether the association of a trait with yield is causal or merely incidental, path coefficient analysis was carried out taking pod yield plant⁻¹ as the dependent variable and the remaining fifteen characters as independent variables, following Dewey and Lu (1959) [4]. The direct and indirect effects at the phenotypic (P) and genotypic (G) levels are presented in Table 2.

Kernel yield plant⁻¹ recorded a very high positive direct effect on pod yield plant⁻¹ at both the phenotypic (P = 1.0767) and genotypic (G = 1.1743) levels, which, coupled with its high and significant correlation with pod yield, confirms that direct selection based on this trait would be highly rewarding for improving pod yield plant⁻¹. Harvest index (P = 0.0062; G = 0.0711), plant height (P = 0.0124; G = 0.1236) and hundred pod weight (P = 0.0015; G = 0.0087) exhibited positive, though comparatively low, direct effects on pod yield; their substantial positive correlation with pod yield was therefore largely mediated through their high

positive indirect effects via kernel yield plant⁻¹ (harvest index: P = 0.845, G = 1.035; plant height: P = 0.369, G = 0.428; hundred pod weight: P = 0.874, G = 1.017).

In contrast, specific leaf area at 60 DAS (P = -0.0158; G = -0.0290) and hundred kernel weight (P = -0.0143; G = -0.0468) showed negative direct effects on pod yield plant⁻¹, despite their significant positive correlation with pod yield; here again, the positive association was mainly attributable to a high positive indirect effect operating through kernel yield plant⁻¹. Days to 50% flowering exerted a negligible negative direct effect at the phenotypic level (P = -0.0277) but a small positive direct effect at the genotypic level (G = 0.0091), its overall negative correlation with pod yield being explained by a strong negative indirect effect via kernel yield plant⁻¹ (P = -0.355; G = -0.586).

Number of mature pods plant⁻¹ (P = 0.0006; G = 0.0301), dry haulm yield plant⁻¹ (P = 0.0028 at phenotypic level, and G = -0.1155 at genotypic level) and SPAD chlorophyll meter reading at 60 DAS (P = 0.0026; G = 0.0688) had negligible direct effects on pod yield, their moderate positive correlation with yield being routed chiefly through kernel yield plant⁻¹ and, to a smaller extent, through plant height. Number of primary branches plant⁻¹ (P = -0.0037; G = -0.0056), days to maturity (P = -0.0135; G = -0.0615), shelling percent, and oil content showed negligible direct effects on pod yield plant⁻¹, consistent with their weak, non-significant correlations with pod yield.

The residual effect was very low both at the phenotypic (0.007) and genotypic (0.001) levels, indicating that the sixteen traits studied together accounted for almost all of the variability in pod yield plant⁻¹ and that no major yield-contributing trait was left unaccounted for in the present study.

Conclusion

The character association study revealed that kernel yield plant⁻¹, hundred pod weight, harvest index, hundred kernel weight, plant height, specific leaf area at 60 DAS and dry haulm yield plant⁻¹ were significantly and positively correlated with pod yield plant⁻¹ at both phenotypic and genotypic levels. Path coefficient analysis further confirmed that kernel yield plant⁻¹ exerted the highest positive direct effect on pod yield plant⁻¹, followed by harvest index, plant height and hundred pod weight, with the remaining traits contributing mainly through their indirect effects via kernel yield plant⁻¹. Therefore, kernel yield plant⁻¹, hundred pod weight and harvest index may be considered the most reliable and effective selection indices, and simultaneous selection based on these component traits, rather than pod yield alone, is recommended for the genetic improvement of pod yield in groundnut.

References

- Al-Jibouri HA, Miller PA, Robinson HV. Genotypic and environmental variance and co-variance in an upland cotton cross of interspecific origin. *Agronomy Journal*,1958;50:633-636.
- Character association and path analysis on groundnut (*Arachis hypogaea* L.). *Int. J. Pure App. Bioscience*, 2(2), 194-197.
- Character association and path analysis under drought in groundnut (*Arachis hypogaea* L.). *Crop Research*, 45, 149-151.
- Dewey DR, Lu KH. A correlation and path coefficient analysis of components of crested wheat grass seed production. *Agronomy Journal*,1959;51:515-518.
- Dolma T, Sekhar M, Reddy MR, K R. Genetic variability and character association in Spanish bunch groundnut (*Arachis hypogaea* L.). *Journal of Oilseeds Research*,2010;27:158-160.
- Gedifew S. Trait correlations and path analysis for kernel yield improvement in groundnut (*Arachis hypogaea* L.) genotypes. *Advances in Bioscience and Bioengineering*,2024;12(4):98-104.
- Genetic variability and path analysis of groundnut (*Arachis hypogaea* L.). *The Agriculturists*, 9(1-2), 29-36.
- Giri RR, Toprope VN, Jagtap PK. Genetic variability, character association and path analysis for yield, its component traits and late leaf spot, *Phaeoisariopsis personata* in groundnut. *International Journal of Plant Sciences*,2009;4:551-555.
- Gupta RP, Vachhani JH, Kachhadia VH, Vaddoria MA, Barad HR. Correlation and path analysis in Virginia groundnut (*Arachis hypogaea* L.). *Electronic Journal of Plant Breeding*,2015;6(1):248-252.
- Hampannavar MR, Khan H, Temburne BV, Janila P, Amaregouda A. Genetic variability, correlation and path analysis studies for yield and yield attributes in groundnut (*Arachis hypogaea* L.). *Journal of Pharmacognosy and Phytochemistry*,2018;7(1):870-874.
- Johnson HW, Robinson HF, Comstock RE. Estimates of genetic and environmental variability in soybean. *Agronomy Journal*,1955;47:413-418.
- Zaman MA, Tuhina-Khatun M, Ullah MZ, Moniruzzamn M, Alam KH. Genetic variability and path analysis of groundnut (*Arachis hypogaea* L.). *The Agriculturists*,2011;9(1-2):29-36.
- Panse VG, Sukhatme PV. *Statistical Methods for Agricultural Workers*. 2nd edn. New Delhi: ICAR Publication, 1967.
- Prabhu R, Manivannan N, Mothilal A, Ibrahim SM. Correlation coefficient analysis for yield and yield attributes in groundnut (*Arachis hypogaea* L.). *Plant Archives*,2015;15(2):685-68.
- Rao VT, Venkanna V, Bhadrud D, Murthy KGK, Reddy SH. Studies on character association and path analysis under Drought in groundnut (*Arachis hypogaea* L.). *Crop Research*,2013;45(2):149-151.
- Thirumala Rao V, Venkanna V, Bhadrud D, Bharathi D. Studies on variability, character association and path analysis on groundnut (*Arachis hypogaea* L.). *Int. J. Pure App. Biosci*,2014;2(2):194-197.
- Vekariya HB, Khanpara MD, Vachhani JH, Jivani LL, Vagadiya KJ, Revan HJ. Correlation and path analysis in bunch groundnut (*Arachis hypogaea* L.). *International Journal of Plant Sciences*,2011;6(5):11-15.
- Vishnuvardhan KM, Vasanthi RP, Reddy KH. Genetic variability studies for yield, yield attributes and resistance to foliar diseases in groundnut (*Arachis hypogaea* L.). *Legume Research*,2013;36:111-115.
- Wright S. Correlation and causation. *Journal of Agriculture Research*,1921;20:557-587.